

SE MRC College Algebra Content Review

Polynomial Functions and Their Graphs Section 3.2

Learning Objectives:

1. Identify polynomial functions.
2. Recognize characteristics of graphs of polynomial functions.
3. Determine end behavior.
4. Use factoring to find zeros of polynomial functions.
5. Identify zeros and their multiplicities.
6. Use the Intermediate Value Theorem.
7. Understand the relationship between degree and turning points.
8. Graph polynomial functions.

3. Find the zeros for the polynomial function and give the multiplicity for each zero. State whether the graph crosses the x-axis and turns around, at each zero.

$$f(x) = -8(x + 2)(x - 6)^2$$

- a. The zeros are _____.
- b. The multiplicity of -2 is _____.
- c. The multiplicity of 6 is _____.
- d. Does the graph of $f(x)$ cross or touch the x-axis and turn around at the x-intercept, -2?

- e. Does the graph of $f(x)$ cross or touch the x-axis and turn around at the x-intercept, 6?

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1. Use the leading coefficient test to determine the end behavior of the graph of the given polynomial function.

$$f(x) = 3x^7 + 7x^6 + 4x^5 + 8$$

2. Use the Leading Coefficient Test to determine the end behavior of the graph of the given polynomial function.

$$f(x) = -3x^4 + 7x^2 - 5x + 2$$

4. Find the zeros for the polynomial function and give the multiplicity for each zero. State whether the graph crosses the x-axis and turns around, at each zero.

$$f(x) = x^3 - 6x^2 + 9x$$

- a. The zeros are _____.
- b. The multiplicity at the leftmost zero is _____.
- c. The multiplicity at the rightmost zero is _____.
- d. Does the graph of $f(x)$ cross or touch the x-axis and turn around at the leftmost zero?

- e. Does the graph of $f(x)$ cross or touch the x-axis and turn around at the rightmost zero?

5. Find the zeros for the polynomial function and give the multiplicity for each zero. State whether the graph crosses the x-axis and turns around, at each zero.

$$f(x) = x^3 + 3x^2 - 4x - 12$$

- The zeros are _____.
- The multiplicity of the greatest zero is _____.
- The multiplicity of the second greatest zero is _____.
- The multiplicity of the smallest zero is _____.
- What is the behavior of the graph at the greatest zero?

- What is the behavior of the graph at the second greatest zero?

- What is the behavior of the graph at the smallest zero?

6. Answer parts a. - f. for the function shown below.

$$f(x) = x^3 + 4x^2 - x - 4$$

- Use the leading coefficient test to determine the graph's end behavior.

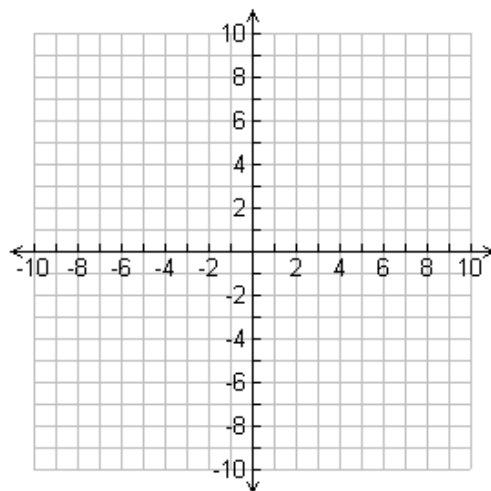
- What are the x-intercepts?

- At which x-intercept(s) does the graph cross the x-axis?

- At which x-intercept(s) does the graph touch the x-axis and turn around?

- The y intercept is $y =$ _____.
- Determine whether the graph has y-axis symmetry, origin symmetry or neither.

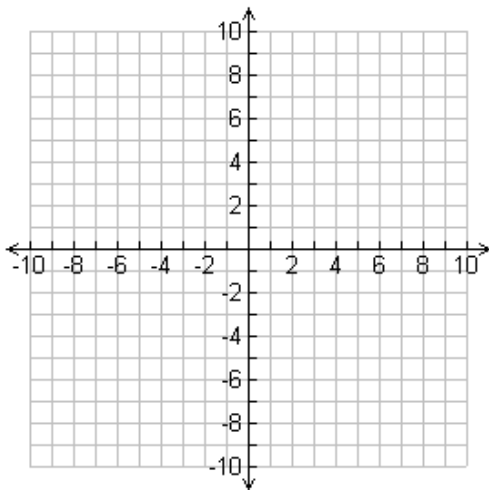
- Graph the function: (find extra points if necessary)



7. Use the given function to answer the questions that follow.

$$f(x) = x^4 - 36x^2$$

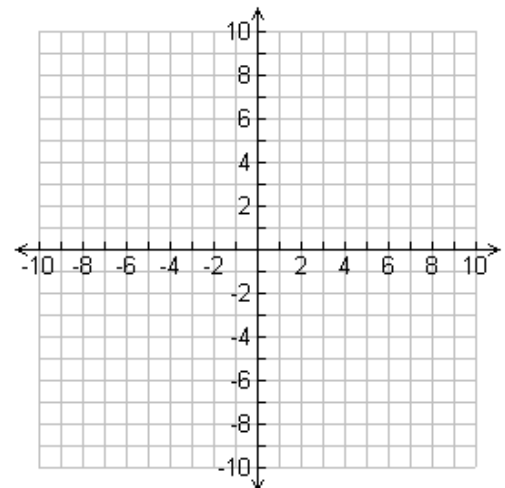
- Use the Leading Coefficient Test to determine the graph's end behavior.
- Find the x-intercepts.
- At which zeros does the graph of the function cross the x-axis?
- At which zeros does the graph of the function touch the x-axis and turn around?
- Find the y-intercept by computing $f(0)$.
 $f(0) =$
- Determine the symmetry of the graph.
(circle the correct answer)
Odd; origin symmetry
Even; y-axis symmetry
Neither
- Determine the graph of the function.



8. Use the following steps to graph the polynomial function $f(x)$.

$$f(x) = x^3(x - 3)^2(x + 5)$$

- Use the Leading Coefficient Test to determine the graph's end behavior.
- Find the x-intercepts.
- What does the graph do at $x=0$?
- What does the graph do at the rightmost zero?
- What does the graph do at the leftmost zero?
- Find the y-intercept.
 $y =$
- Determine the symmetry of the graph.
(circle the correct answer)
Odd; origin symmetry
Even; y-axis symmetry
Neither
- Determine the graph of the function.



9. Use the following steps to graph the polynomial function $f(x)$.

$$f(x) = -4(x - 4)^2(x^2 - 1)$$

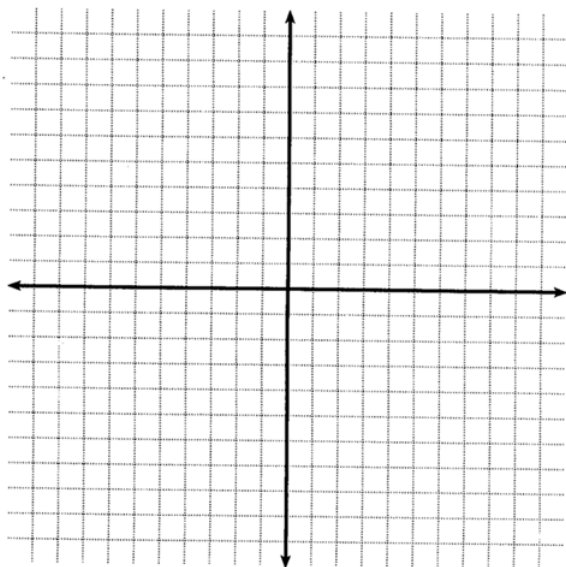
- Use the Leading Coefficient Test to determine the graph's end behavior.

- Find the x-intercepts.

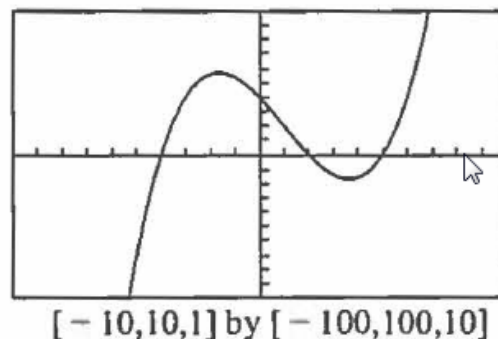
- At which zeros does the graph of the function cross the x-axis?

- At which zeros does the graph of the function touch the x-axis and turn around?

- Find the y-intercept.
y = _____
- Determine the symmetry of the graph. (circle the correct answer)
Odd; origin symmetry
Even; y-axis symmetry
Neither
- Determine the graph of the function.



10. The graph to the right (bottom) is a complete graph, that is, it is continuous and displays the function's end behavior. All zeros are integers. Answer the following questions.



Find the zeros and state whether the multiplicity of each zero is even or odd.

- What is the value of the negative zero? Is the multiplicity of this zero even or odd?

- What is the value of the largest zero? Is the multiplicity of this zero even or odd?

- What is the value of the other zero? Is the multiplicity of this zero even or odd?

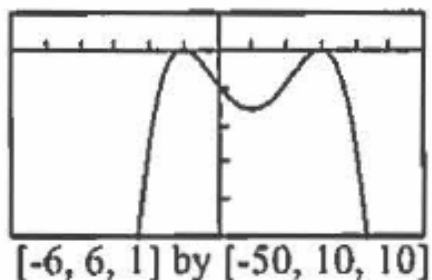
Write an equation, expressed as the product of factors, of a polynomial that the graph might represent. Use a leading coefficient of 1 or -1, and make the degree as small as possible.

- What is an equation for a polynomial that the graph might represent, using the above constraints?

Use the equation from part (d) to find the y-intercept.

- What is the y-intercept of the graph?

11. The complete graph of a polynomial function whose zeros are integers are shown.



Find the zeros and state whether the multiplicity of each zero is even or odd.

- What is the value of the leftmost zero? Is the multiplicity of this zero even or odd?

- What is the value of the rightmost zero? Is the multiplicity of this zero even or odd?

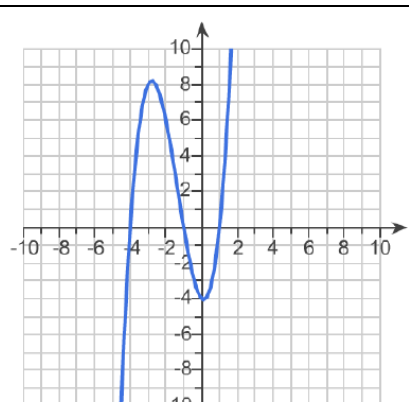
Write an equation, expressed as the product of factors, of a polynomial that the graph might represent. Use a leading coefficient of 1 or -1, and make the degree off as small as possible.

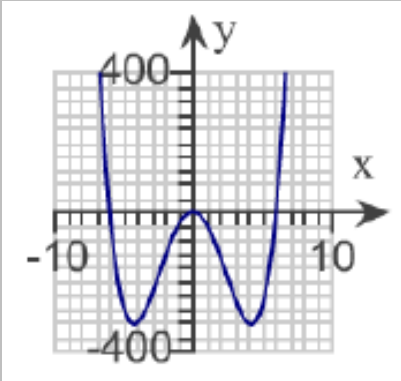
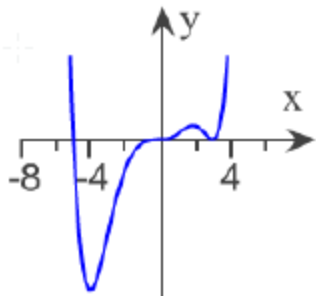
- What is an equation for a polynomial that the graph might represent, using the above constraints?

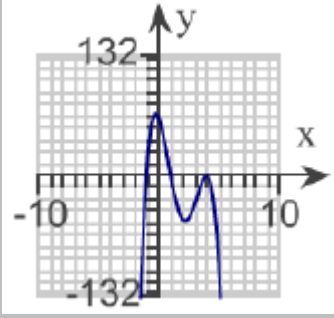
Use the equation from part (d) to find the y-intercept.

- What is the y-intercept of the graph?

Answer Key:

1.		Falls left & rises right.
2.		The graph of $f(x)$ falls to the left and falls to the right.
3.	a.	-2,6
	b.	1
	c.	2
	d.	Cross
	e.	Touches the x-axis and turns around.
4.	a.	0,3
	b.	1
	c.	2
	d.	Crosses the x-axis
	e.	Touches the x-axis and turns around.
5.	a.	2, -2, -3
	b.	1
	c.	1
	d.	1
	e.	Crosses the x-axis
	f.	Crosses the x-axis
	g.	Crosses the x-axis
6.	a.	The graph falls to the left and rises to the right.
	b.	-1,1, -4
	c.	-1,1, -4
	d.	There are no x-intercepts at which the graph touches the x-axis and turns around.
	e.	-4
	f.	Neither
	g.	

7.	a.	The graph of $f(x)$ rises left and rises right.
	b.	$-6, 6, 0$
	c.	$-6, 6$
	d.	0
	e.	0
	f.	Even; y-axis symmetry
	g.	
8.	a.	The graph rises to the left and rises to the right.
	b.	$0, 3, -5$
	c.	The graph crosses the x-axis.
	d.	The graph touches the x-axis and turns around.
	e.	The graph crosses the x-axis.
	f.	0
	g.	neither
9.	h.	
	a.	The graph falls to the left and falls to the right.
	b.	$-1, 1, 4$
	c.	$-1, 1$
	d.	4
	e.	64
	f.	Neither

	g.	
10.	a.	-4 , odd
	b.	5 , odd
	c.	2 , odd
	d.	$f(x) = (x - 2)(x - 5)(x + 4)$
	e.	40
11.	a.	-1 , even
	b.	3 , even
	c.	$f(x) = -(x + 1)^2(x - 3)^2$
	d.	-9